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Sequence Listing

<10> Sidhu, Sachdev S.  
Weiss, Gregory A.  
Wells, James A.

<120> IMPROVEMENTS IN PHAGE DISPLAY

<130> P1581R2

<140> US 09/380,447

<141> 1999-09-01

<150> US 60/134,870

<151> 1999-05-19

<150> US 60/133,296

<151> 1999-05-10

<150> US 60/103,514

<151> 1998-10-08

<150> US 60/094,291

<151> 1998-07-27

<150> PCT/USUS99/16596

<151> 1999-07-22

<160> 287

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<212> PRT

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<223> Synthetic coat protein

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<221> unsure

<222> 12-30

<223> unknown amino acid

<400> 1

Met Ser Lys Ser Thr Phe Lys Lys Phe Leu Lys Xaa Xaa Xaa Xaa  
1 5 10 15

Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa Xaa  
20 25 30

Glu Thr Ala Ser Ala Gln Leu Ser Asn Phe Ala Ala Lys Ala Pro  
35 40 45

Asp Asp Gly Glu Ala  
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<222> 1-50  
<223> coat protein VIII

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Ala Glu Gly Asp Asp Pro Ala Lys Ala Ala Phe Asn Ser Leu Gln  
1 5 10 15  
Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala Trp Ala Met Val Val  
20 25 30  
Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu Phe Lys Lys Phe  
35 40 45  
Thr Ser Lys Ala Ser  
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<223> coat protein VIII

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Ala Glu Gly Asp Asp Pro Ala Lys Ala Ala Phe Asp Ser Leu Gln  
1 5 10 15  
Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala Trp Ala Met Val Val  
20 25 30  
Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu Phe Lys Lys Phe  
35 40 45  
Thr Ser Lys Ala Ser  
50

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<222> 1-50

<223> coat protein VIII

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Ala Glu Gly Asp Asp Pro Ala Lys Ala Ala Phe Asp Ser Leu Gln  
1 5 10 15

Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala Trp Ala Met Val Val  
20 25 30

Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu Phe Lys Lys Phe  
35 40 45

Thr Ser Lys Ala Ser  
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<212> PRT

<213> Zj-2 phage

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<221> Zj-2 phage

<222> 1-50

<223> coat protein VIII

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Ala Glu Gly Asp Asp Pro Ala Lys Ala Ala Phe Asp Ser Leu Gln  
1 5 10 15

Ala Ser Ala Thr Glu Tyr Ile Gly Tyr Ala Trp Ala Met Val Val  
20 25 30

Val Ile Val Gly Ala Thr Ile Gly Ile Lys Leu Phe Lys Lys Phe  
35 40 45

Ala Ser Lys Ala Ser  
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<222> 1-50

<223> coat protein VIII

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Asp Asp Ala Thr Ser Gln Ala Lys Ala Ala Phe Asp Ser Leu Thr  
1 5 10 15

Ala Gln Ala Thr Glu Met Ser Gly Tyr Ala Trp Ala Leu Val Val  
20 25 30

Leu Val Val Gly Ala Thr Val Gly Ile Lys Leu Phe Lys Lys Phe  
35 40 45

Val Ser Arg Ala Ser  
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<222> 1-50  
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Ser Thr Ala Thr Ser Tyr Ala Thr Glu Ala Met Asn Ser Leu Lys  
1 5 10 15

Thr Gln Ala Thr Asp Leu Ile Asp Gln Thr Trp Pro Val Val Thr  
20 25 30

Ser Val Ala Val Ala Gly Leu Ala Ile Arg Leu Phe Lys Lys Phe  
35 40 45

Ser Ser Lys Ala Val  
50

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<212> PRT  
<213> Ike phage

<220>  
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<222> 1-50  
<223> coat protein VIII

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Asn Ala Ala Thr Asn Tyr Ala Thr Glu Ala Met Asp Ser Leu Lys  
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Thr Gln Ala Ile Asp Leu Ile Ser Gln Thr Trp Pro Val Val Thr  
20 25 30

Thr Val Val Val Ala Gly Leu Val Ile Arg Leu Phe Lys Lys Phe  
35 40 45

Ser Ser Lys Ala Val  
50

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aaaagaattc ccgacacccat cgaatggtgc 30

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<212> DNA

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<223> oligonucleotide primer

<400> 10

accagatgca taagccgagg cggaaaacat catcg 35

<210> 11

<211> 56

<212> DNA

<213> Artificial sequence

<220>

<223> oligonucleotide primer

<400> 11

ttttctagac aggctccca ccagatgcat aagccgaggc ggaaaacatc 50

atcgtc 56

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<211> 34

<212> DNA

<213> Artificial sequence

<220>

<223> oligonucleotide primer

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gctatcgga tgcacgggc atcaccggca cctg 34

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gagtcacagt cgtcaggcgc ctctccgga, tcctccaccc accttggtga 50

aggtgtcgtg g 61

all  
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gggtatctag aggttgag 18

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tggagctccc ggatcctcca ccgctctgga agccacagct gccctc 46

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ggatccggga gctccagctg atgaggtgac gatcccgcaa aa 42

<210> 17  
<211> 42  
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gatcccgcaa aagcggcctg atgatccctg caagcctcag cg 42

<210> 18  
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<212> DNA  
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<220>  
<223> mutagenic oligonucleotide

<400> 18  
caagcctcag cgaccgaatg atgaggttat gcgtgggcga tg 42

<210> 19  
<211> 42  
<212> DNA  
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<400> 19  
cgctgggcga tggttgtttg atgagtcggc gcaactatcg gt 42

<210> 20  
<211> 42  
<212> DNA  
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<220>  
<223> mutagenic oligonucleotide

<400> 20  
gcaactatcg gtatcaagtg atgaaagaaa ttcacctcga aa 42

<210> 21  
<211> 66  
<212> DNA  
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<220>  
<221> unsure  
<222> 20, 22, 26, 28, 31, 34, 38, 41, 44, 47  
<223> unknown base

<400> 21  
ggatccggga gctccagcrn tnasrntnas nasnycrnr narnttrnttt 50  
taactccctg caagcc 66

<210> 22  
<211> 66  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide

<220>  
<221> unsure  
<222> 19, 22, 26, 28, 31, 35, 38, 41, 44, 46  
<223> unknown base

<400> 22

gatcccgcaa aagcggccnw tnasrntnyt nasrntnrtr ntrntnasta 50

tatcggttat gcgtgg 66

<210> 23

<211> 70

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<220>

<221> unsure

<222> 19, 22, 25, 28, 31, 35, 38, 41, 44, 47

<223> unknown base

<400> 23

caagcctcag cgaccgaanw cnwcnktnwc nyytnkgnyt nkgnwtntwg 50

tcattgtcgg cgcaactatc 70

<210> 24

<211> 66

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<220>

<221> unsure

<222> 19, 22, 25, 28, 31, 34, 37-38, 40-41, 43-44

<223> unknown base

<400> 24

gcgtggggcga tgggtgttnw tnwcnwtntkt nytnytnntn ntnntaagct 50

gtttaagaaa ttcacc 66

<210> 25

<211> 72

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<220>

<221> unsure

<222> 19-20, 22-23, 31-32, 34-35, 37-38, 43-44, 46-47

<223> unknown base

<400> 25

gcaactatcg gtatcaagnn gnnsaagaaa nnsnngnnga aanngnngtg 50



ataaaccgat acaattaaag gc 72

<210> 26

<211> 66

<212> DNA

<213> Artificial sequence

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<400> 26

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tatcgggttat gcgtgg 66

<210> 27

<211> 36

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 27

ccgacaccct ccaatgctga ggaaacacaa cagaaa 36

<210> 28

<211> 36

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 28

ttcaggaagg acatggctaa ggtcgagaca ttcttg 36

<210> 29

<211> 75

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 29

aactacgggc tgctcgcttg cttcaggaag gacatggaca aggtcgagac 50

attctgggt atcgtgcagt gccgc 75

<210> 30

<211> 57

<212> DNA

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ttcaggaagg acatggacgc tgtcgagaca ttcttggtta tcgtccagtg 50  
ccgctct 57

<210> 31  
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ggtggaggat ccgggagctg atgagccgag ggtgacgatc cc 42

<210> 32  
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<212> DNA  
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caccaagggtg gtctagagct aataataagc cgagggtgac gatccc 46

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<223> P12-1 variant

<400> 33  
Met Ser Lys Ser Thr Phe Lys Lys Phe Leu Lys Val Phe Val Phe  
1 5 10 15  
Ser Val Asp Val Asp Asn Asn Trp Ile Trp Ala Val Gly Ile Ile  
20 25 30  
Tyr Met Leu Leu Val Glu Ala Ser Pro Trp Ala Ala Lys Ala Pro  
35 40 45  
Asp Asp Gly Glu Ala  
50

<210> 34  
<211> 93  
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<213> Artificial sequence

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<223> oligonucleotide linker library

<400> 34

gagggcagct gtggcttcgg tggcggtvvc vvcvvcvvcv vcvvcvvcv 50

cvvcvvcvvc vvcvvcvvcg gcggtgccga gggtagacgat ccc 93

<210> 35

<211> 51

<212> DNA

<213> Artificial sequence

<220>

<223> oligonucleotide linker library

<400> 35

caccaaggtg gtctagagvv cvvcvvcvvc vvcgccgagg gtgacgatcc 50

c 51

<210> 36

<211> 67

<212> DNA

<213> Artificial sequence

<220>

<221> Artificial sequence

<222> 1-67

<223> oligonucleotide linker library

<400> 36

caccaaggtg gtctagagcv vcvvcvvcv cvvcvvcvvc vvcvvcvvcg 50

ccgaggggtga cgatccc 67

<210> 37

<211> 82

<212> DNA

<213> Artificial sequence

<220>

<223> oligonucleotide linker library

<400> 37

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vcvvcvvcv cvvcgccgag ggtgacgate cc 82

<210> 38

<211> 97

<212> DNA

<213> Artificial sequence

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vcvcvcvcvv cvvcvcvcvc vcvcvcvcvg ccgagggtga cgatccc 97

<210> 39  
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<212> DNA  
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<223> oligonucleotide linker library

<400> 39  
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vcvcvcvcvv cvvcvcvcvc vcvcvcvcvv vcvcvcvcvv cvvcgccgag 100  
ggtgacgac cc 112

<210> 40  
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aagttcgcta gagatgctta tgaggctctt gaggatattg ctactaacta 50  
tatcggttat gcgtgg 66

<210> 41  
<211> 66  
<212> DNA  
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<400> 41  
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cattgtcggc gcaact 66

<210> 42  
<211> 33  
<212> DNA  
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<400> 42  
gcaaaagcgg cctataacgc tcttgaggat att 33

<210> 43  
<211> 33  
<212> DNA  
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<400> 43  
tatgaggctc ttgaggccat tgctactaac tat 33

<210> 44  
<211> 33  
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<400> 44  
gaggctcttg aggattcagc tactaactat atc 33

<210> 45  
<211> 66  
<212> DNA  
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<400> 45  
gatcccgcaa aagcggccta tgaggctctt gaggatattg ctactaacta 50  
tatcggttat gcgtgg 66

<210> 46  
<211> 66  
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<400> 46  
gagggcagct gtggcttcca gagcgggtgga ggatccggga gctccagcgc 50  
cgaggggtgac gatccc 66

<210> 47

<211> 60  
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<220>  
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<400> 47  
cccgcaaaag cggcctttaa cgctctgcaa gccattgcga ccgaatatat 50  
  
cggttatgcg 60

<210> 48  
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caagcctcag cgaccgaact tttctttctc cttgggactg tgcattctgt 50  
  
cattgtcggc gcaact 66

 <210> 49  
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<400> 49  
tccgggagct ccagcgcaa gactgagaag ttc 33

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<400> 50  
gggagctcca gcatgagag tgagaagttc gct 33

<210> 51  
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<400> 51  
agctccagcg ataaggggtga gaagttcgct aga 33

<210> 52  
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<400> 52  
tccagcgata agagtgcaca gtctcgctaga gat 33

<210> 53  
<211> 33  
<212> DNA  
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<220>  
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<400> 53  
agcgataaga gtgaggattt cgctagagat gct 33

<210> 54  
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<212> DNA  
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<220>  
<223> mutagenic oligonucleotide

<400> 54  
gataagagtg agaagccgc tagagatgct ttt 33

<210> 55  
<211> 33  
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<400> 55  
agtgagaagt tcgctaaaga tgcttttaac tcc 33

<210> 56  
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<212> DNA  
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<220>  
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<223> mutagenic oligonucleotide

<400> 56

gagaagtctg ctagagcggc ttttaactcc ctg 33

<210> 57

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<400> 57

cccgcaaaag cggcctttga ggctcttgag gat 33

<210> 58

<211> 34

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<400> 58

gcaaaagcgg cctataaacg ctcttgagga tatt 34

<210> 59

<211> 33

<212> DNA

<213> Artificial sequence

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<223> mutagenic oligonucleotide

<400> 59

aaagcggcct atgagtcct tgaggatatt gct 33

<210> 60

<211> 33

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<220>

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<400> 60

gcctatgagg ctcttcaaga tattgctact aac 33

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<212> DNA

<213> Artificial sequence

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<223> mutagenic oligonucleotide

<400> 61

tatgaggctc ttgaggccat tgctactaac tat 33

<210> 62

<211> 33

<212> DNA

<213> Artificial sequence

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<400> 62

gaggctcttg aggattcagc tactaactat atc 33

<210> 63

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<212> DNA

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<210> 65

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<400> 65

tcagcgaccg aacttatctt tctccttggg act 33

<210> 66

<211> 33

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<400> 66

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<211> 33

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<223> mutagenic oligonucleotide

<400> 67

accgaacttt tcttttatct tgggactgtg cat 33

<210> 68

<211> 33

<212> DNA

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<223> mutagenic oligonucleotide

<400> 68

gaacttttct ttctcgcgga gactgtgcat ctt 33

<210> 69

<211> 33

<212> DNA

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<223> mutagenic oligonucleotide

<400> 69

cttttctttc tcctttggac tgtgcatctt gtc 33

<210> 70

<211> 33

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 70

ttctttctcc ttggggcggt gcatcttgtc att 33

<210> 71

<211> 33

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 71

tttctccttg ggactatgca tcttgctcatt gtc 33

<210> 72

<211> 33

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 72

ctccttgagg ctgtggttct tgctcattgtc ggc 33

<210> 73

<211> 33

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 73

cttgggactg tgcattgtgt cattgtcggc gca 33

<210> 74

<211> 36

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 74

gcaaaagcgg cctataactc ccttgaggat attgct 36

<210> 75

<211> 48

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 75

gcaaaagcgg cctataacgc tcttgaggat tcagctacta actatatc 48

<210> 76

<211> 60

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 76

cccgc aaaag cggcctatga gtcccttgag gattcagcta ctaactatat 50

cggttatgcg 60

<210> 77

<211> 48

<212> DNA

<213> Artificial sequence

<220>

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<400> 77

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<210> 78

<211> 10

<212> PRT

<213> Artificial sequence

<220>

<223> peptide linker

<400> 78

Gln Ser Gly Gly Gly Ser Gly Ser Ser Ser  
1 5 10

<210> 79

<211> 5

<212> PRT

<213> Artificial sequence

<220>

<223> penta peptide

<400> 79

Gly Gly Arg Pro Val  
1 5

<210> 80

<211> 34

<212> DNA

<213> Artificial sequence

<220>

<223> linker oligonucleotide

<400> 80

cagagcgggtg gaggatccgg gagctccaga gggt 34

<210> 81

<211> 39

<212> DNA  
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<400> 81  
cagagcgggtg gaggatccgg gagctccagc gccgagggt 39

<210> 82  
<211> 12  
<212> PRT  
<213> Artificial sequence

<220>  
<223> peptide flag

<400> 82  
Met Ala Asp Pro Asn Arg Phe Arg Gly Lys Asp Leu  
1 5 10

<210> 83  
<211> 60  
<212> DNA  
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<220>  
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<400> 83  
gatggtgaag ctgcggctga tgcacctcgtg agcgtctaga gccaccatca 50  
ccatcaccat 60

<210> 84  
<211> 60  
<212> DNA  
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<220>  
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<400> 84  
gctgtcggta ttatttacat gctcctcgtg gaggcgtcgc cctgggctgc 50  
taaggcgcca 60

<210> 85  
<211> 33  
<212> DNA  
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<220>  
<223> mutagenic oligonucleotide

<400> 85  
acctcgaaag caagccatca ccatcaccat gcg 33

<210> 86  
<211> 36  
<212> DNA  
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<220>  
<223> mutagenic oligonucleotide

<400> 86  
acctcgaaag caagcggcca tcaccatcac catgcg 36

<210> 87  
<211> 39  
<212> DNA  
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<220>  
<223> mutagenic oligonucleotide

<400> 87  
acctcgaaag caagcgggtgg ccatcaccat caccatgcg 39

<210> 88  
<211> 42  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide

<400> 88  
acctcgaaag caagcgggtgg tggccatcac catcaccatg cg 42

<210> 89  
<211> 45  
<212> DNA  
<213> Artificial sequence

<220>  
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<400> 89  
acctcgaaag caagcggcggtg tgggtggccat caccatcacc atgcg 45

<210> 90  
<211> 51  
<212> DNA  
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<220>  
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<400> 90  
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g 51

<210> 91  
<211> 54  
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<220>  
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<400> 91  
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tgcg 54

<210> 92  
<211> 57  
<212> DNA  
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<400> 92  
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ccatgcg 57

<210> 93  
<211> 60  
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<400> 93  
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tcaccatgcg 60

<210> 94  
<211> 63  
<212> DNA  
<213> Artificial sequence

<220>  
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<400> 94  
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ccatcaccat gcg 63

<210> 95

<211> 69

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 95

acctcgaaaag caagcgggtgg cgggtggcgggt ggcgggtggcg gcgggtgggtgg 50

ccatcaccat caccatgcg 69

<210> 96

<211> 75

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 96

acctcgaaaag caagcgggtgg tgggtggcgggt ggcgggtggcg gtgggtggcgg 50

tgggtggccat caccatcacc atgcg 75

<210> 97

<211> 81

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 97

acctcgaaaag caagcggcgg cgggtgggtgggt ggcgggtggcg gtggcgggtgg 50

tggcgggtgggt ggccatcacc atcaccatgc g 81

<210> 98

<211> 87

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide

<400> 98

acctcgaaaag caagcggcgg tggcggcgggt ggtgggtggcg gtggcgggtgg 50

cgggtgggtggc ggtgggtggcc atcaccatca ccatgcg 87

<210> 99



<211> 93  
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<220>  
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<400> 99  
acctcgaaaag caagcgggtgg tggcgggtggc ggcgggtggtg gtggcgggtgg 50  
cggtggcgggt ggtggcgggtg gtggccatca ccatcaccat gcg 93

<210> 100  
<211> 60  
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<220>  
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<220>  
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<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35  
<223> unknown base

<400> 100  
caaggaccat agattatgnn snnsnnsnns nnsnnsaagt ttctgaaagt 50  
ttttgttttt 60

<210> 101  
<211> 57  
<212> DNA  
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<220>  
<223> zone library

<220>  
<221> unsure  
<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35  
<223> unknown base

<400> 101  
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tgttgat 57

<210> 102  
<211> 69  
<212> DNA  
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<220>  
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<220>  
<221> unsure  
<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35, 37-38, 40-41, 43-44,  
46-47  
<223> unknown base  
  
<400> 102  
ttcaaaaagt ttctgaaann snnnsnnsnns nnsnnsnnsn nsnnnsnnsaa 50  
  
ttggatttgg gctgtcgg 69  
  
<210> 103  
<211> 69  
<212> DNA  
<213> Artificial sequence  
  
<220>  
<223> zone library  
  
<220>  
<221> unsure  
<222> 22-23, 25-26, 28-29, 31-32, 34-35, 37-38, 40-41, 43-44, 46-47,  
49-50  
<223> unknown base  
  
<400> 103  
gttttttctg ttgatgttga tnnnsnnsnns nnsnnsnnsn nsnnnsnnsn 50  
  
sgcggctgat gcattccca 69  
  
<210> 104  
<211> 72  
<212> DNA  
<213> Artificial sequence  
  
<220>  
<223> zone library  
  
<220>  
<221> unsure  
<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35, 37-38, 40-41, 43-44,  
46-47  
<223> unknown base  
  
<400> 104  
tgggctgtcg gtattattnn snnnsnnsnns nnsnnsnnsn nsnnnsnns 50  
  
tgctaaggcg ccagacgatg gt 72  
  
<210> 105  
<211> 69

<212> DNA  
<213> Artificial sequence


<220>  
<223> zone library

<220>  
<221> unsure  
<222> 22-23, 25-26, 28-29, 31-32, 34-35, 37-38, 40-41, 43-44, 46-47,  
49-50  
<223> unknown base

<400> 105  
agcgctcagc tgagcaactt cnsnsnsns nnsnsnsns nsnsnsnsn 50  
sgcggtgat gcattccca 69

<210> 106  
<211> 81  
<212> DNA  
<213> Artificial sequence

<220>  
<223> linker library

 <400> 106  
gatggtgaag ctgcggtvv cvvcvvcvvc vvcvvcvvcv vcvvcvvcv 50  
cvvcvvcvvc gatgcattcc caactatacc a 81

<210> 107  
<211> 96  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide

<220>  
<221> unsure  
<222> 22, 25, 28, 31, 34, 37, 40, 43, 46, 49, 52, 55, 58, 61, 64, 67  
,  
70, 73, 76  
<223> unknown base

<400> 107  
actttcaaaa agtttctgaa anwtknknt nytnytnktn wtnwtntnw 50  
tnwtknknyt nkgnytwnwn ktnwtntwga gactgctagc gctcag 96

<210> 108  
<211> 21  
<212> DNA  
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<220>  
<223> synthetic oligonucleotide

<400> 108  
caccatcacc atcaccatgc g 21

<210> 109  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> linker oligonucleotide

<400> 109  
gcctgggagg agaacatcga cagcgccccc 30

<210> 110  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> linker peptide

<400> 110  
Ala Trp Glu Glu Asn Ile Asp Ser Ala Pro  
1 5 10

<210> 111  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> linker oligonucleotide

<400> 111  
cagtacggga cgccggacac cgacaccgac 30

<210> 112  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> linker peptide

<400> 112  
Gln Tyr Gly Thr Pro Asp Thr Asp Thr Asp  
1 5 10

<210> 113  
<211> 30

<212> DNA  
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<220>  
<223> linker oligonucleotide  
  
<400> 113  
acggggtggt tggaggggcc cgacaccccc 30

<210> 114  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> linker peptide

<400> 114  
Thr Gly Trp Leu Glu Gly Pro Asp Thr Pro  
1 5 10

<210> 115  
<211> 24  
<212> DNA  
<213> Artificial sequence

<220>  
<223> linker oligonucleotide

<400> 115.  
ctcatgggcc ccggcgcgga cggc 24

<210> 116  
<211> 8  
<212> PRT  
<213> Artificial sequence

<220>  
<223> linker peptide

<400> 116  
Leu Met Gly Pro Gly Ala Asp Gly  
1 5

<210> 117  
<211> 24  
<212> DNA  
<213> Artificial sequence

<220>  
<223> linker oligonucleotide

<400> 117  
cacgaatcgg tcccagacaa cggc 24

<210> 118  
<211> 8  
<212> PRT  
<213> Artificial sequence

<220>  
<223> linker peptide

<400> 118  
His Asp Ser Val Pro Ser Asn Gly  
1 5

<210> 119  
<211> 120  
<212> DNA  
<213> Artificial sequence

<220>  
<223> linker oligonucleotide

<400> 119  
atgagcaaga gcactttcaa aaagtttctg aaagagactg ctagcgctca 50  
gctgagcaac ttcgctgcta aggcgccaga cgatggtgaa gctgcggctc 100  
accatcacca tcaccatgcg 120

<210> 120  
<211> 40  
<212> PRT  
<213> Artificial sequence

<220>  
<223> linker peptide

<400> 120  
Met Ser Lys Ser Thr Phe Lys Lys Phe Leu Lys Glu Thr Ala Ser  
1 5 10 15  
Ala Gln Leu Ser Asn Phe Ala Ala Lys Ala Pro Asp Asp Gly Glu  
20 25 30  
Ala Ala Ala His His His His His His Ala  
35 40

<210> 121  
<211> 41  
<212> PRT  
<213> Artificial sequence

<220>  
<223> M13 coat protein VIII library

<220>  
<221> unsure

<222> 12  
<223> unknown amino acid

<400> 121  
Met Ser Lys Ser Thr Phe Lys Lys Phe Leu Lys Xaa Glu Thr Ala  
1 5 10 15  
Ser Ala Gln Leu Ser Asn Phe Ala Ala Lys Ala Pro Asp Asp Gly  
20 25 30  
Glu Ala Ala Ala His His His His His His Ala  
35 40

<210> 122  
<211> 51  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide

<400> 122  
gctgcggctg atgcatctgg tagcgtctag agccaccatc accatcacca 50  
t 51

*at cont*  
<210> 123  
<211> 54  
<212> PRT  
<213> Artificial sequence ..

<220>  
<223> P1-1 plus linker

<400> 123  
Met Ser Lys Ser Thr Phe Lys Lys Phe Leu Lys Val Phe Val Phe  
1 5 10 15  
Ser Val Asp Val Asp Asn Asn Trp Ile Trp Ala Val Gly Ile Ile  
20 25 30  
Glu Thr Ala Ser Ala Gln Leu Ser Asn Phe Ala Ala Lys Ala Pro  
35 40 45  
Asp Asp Gly Glu Ala Ala Ala Asp Ala  
50

<210> 124  
<211> 150  
<212> DNA  
<213> Artificial sequence

<220>  
<223> M13 coat protein VIII variant

<400> 124  
atgagcaaga gcactttcaa aaagtttctg aaagtttttg ttttttctgt 50  
tgatgttgat aataattgga tttgggctgt cggattatt tacatgctcc 100  
tcgtggaggc gtcgccttg gctgctaagg cgccagacga tgggaagct 150

<210> 125  
<211> 48  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide library

<220>  
<221> unsure  
<222> 19-20, 22-23, 25-26, 28-29  
<223> unknown base

<400> 125  
ttcacctcga aagcaagcnn snnsnnsnns caccatcacc atcaccat 48

<210> 126  
<211> 51  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide library

<220>  
<221> unsure  
<222> 19-20, 22-23, 25-26, 28-29, 31-32  
<223> unknown base

<400> 126  
ttcacctcga aagcaagcnn snnsnnsnns nnsccaccatc accatcacca 50

t 51

<210> 127  
<211> 54  
<212> DNA  
<213> Artificial sequence

<220>  
<223> mutagenic oligonucleotide library

<220>  
<221> unsure  
<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35  
<223> unknown base

<400> 127



ttcacctcga aagcaagcnn snnsnnsnns nnsnnsccacc atcaccatca 50

ccat 54

<210> 128

<211> 60

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide library

<220>

<221> unsure

<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35

<223> unknown base

<400> 128

ttcacctcga aagcaagcnn snnsnnsnns nnsnnsvvcv vccaccatca 50

ccatcaccat 60

<210> 129

<211> 66

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide library

<220>

<221> unsure

<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35

<223> unknown base

<400> 129

ttcacctcga aagcaagcnn snnsnnsnns nnsnnsvvcv vcvvcvcca 50

ccatcaccat caccat 66

<210> 130

<211> 75

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide library

<220>

<221> unsure

<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35

<223> unknown base

<400> 130

ctgcgtaata aggagtctnn snnsnnsnns nnsnnsccacc atcaccatca 50

ccattaatca tgccagttct tttgg 75

<210> 131

<211> 81

<212> DNA

<213> Artificial sequence

<220>

<223> mutagenic oligonucleotide library

<220>

<221> unsure

<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35, 37-38, 40-41

<223> unknown base

<400> 131

ctgcgtaata aggagtctnn snnsnnsnns nnsnnsnnsn nscaccatca 50

ccatcaccat taatcatgcc agttcttttg g 81

<210> 132

<211> 87

<212> DNA

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<220>

<223> mutagenic oligonucleotide library

<220>

<221> unsure

<222> 19-20, 22-23, 25-26, 28-29, 31-32, 34-35, 37-38, 40-41, 43-44,

46-47

<223> unknown base

<400> 132

ctgcgtaata aggagtctnn snnsnnsnns nnsnnsnnsn nsnnnsnnsca 50

ccatcaccat caccattaat catgccagtt ctttttg 87

<210> 133

<211> 30

<212> DNA

<213> Artificial sequence

<220>

<223> linker oligonucleotide

<400> 133

gggcaggcca ggatcgtcta ccggcagaag 30

<210> 134

<211> 10

<212> PRT

all  
cont

<213> Artificial sequence

<220>

<223> peptide linker

<400> 134

Gly Gln Ala Arg Ile Val Tyr Arg Gln Lys  
1 5 10

<210> 135

<211> 30

<212> DNA

<213> Artificial sequence

<220>

<223> linker oligonucleotide

<400> 135

aggatcaggg tcctgcagaa gggcaaggag 30

<210> 136

<211> 10

<212> PRT

<213> Artificial sequence

<220>

<223> peptide linker

<400> 136

Arg Ile Arg Val Leu Gln Lys Gly Lys Glu  
1 5 10

<210> 137

<211> 30

<212> DNA

<213> Artificial sequence

<220>

<223> linker oligonucleotide

<400> 137

cgcgccaaga tcgagcagat ctgcaaggag 30

<210> 138

<211> 10

<212> PRT

<213> Artificial sequence

<220>

<223> peptide linker

<400> 138

Arg Ala Lys Ile Glu Gln Ile Cys Lys Glu  
1 5 10

<210> 139  
<211> 27  
<212> DNA  
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<220>  
<223> M13 coat protein VIII fragment oligonucleotide library

<220>  
<221> unsure  
<222> 2, 4, 8, 10, 13, 17, 20, 23, 26  
<223> unknown base

<400> 139  
rntnasrntn asnycrntn arntnt 27

<210> 140  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> M13 wt coat protein VIII fragment oligonucleotide

<400> 140  
gccgaggggtg acgatcccgcc aaaagcggcc 30

<210> 141  
<211> 10  
<212> PRT  
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<220>  
<223> M13 wt coat protein VIII fragment

<400> 141  
Ala Glu Gly Asp Asp Pro Ala Lys Ala Ala  
1 5 10

<210> 142  
<211> 30  
<212> DNA  
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<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 142  
gataagagtg agaagttcgc tagagatgct 30

<210> 143  
<211> 10  
<212> PRT  
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<220>  
<223> M13 variant coat protein VIII fragment

<400> 143  
Asp Lys Ser Glu Lys Phe Ala Arg Asp Ala  
1 5 10

<210> 144  
<211> 30  
<212> DNA  
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<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 144  
aataaggatg agcagttcgc tagagctgct 30

<210> 145  
<211> 10  
<212> PRT  
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<220>  
<223> M13 variant coat protein VIII fragment

<400> 145  
Ile Lys Asp Glu Gly Phe Ala Arg Ala Ala  
1 5 10

<210> 146  
<211> 30  
<212> DNA  
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<220>  
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<400> 146  
atttacatta aggagaccag taaaaatgct 30

<210> 147  
<211> 10  
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<220>  
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<400> 147  
Ile Tyr Ile Lys Glu Thr Ser Lys Asn Ala  
1 5 10

<210> 148  
<211> 30

<212> DNA  
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<220>  
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<400> 148  
aattacgttg accaggtcag taaaaatgct 30

<210> 149  
<211> 10  
<212> PRT  
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<400> 149  
Asn Tyr Val Asp Gln Val Ser Lys Asn Ala  
1 5 10

<210> 150  
<211> 30  
<212> DNA  
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<400> 150  
gctaaggctg aggagttcgc tgaagctgct 30

<210> 151  
<211> 10  
<212> PRT  
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<220>  
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<400> 151  
Ala Lys Ala Glu Glu Phe Ala Glu Ala Ala  
1 5 10

<210> 152  
<211> 30  
<212> DNA  
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<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 152  
gctgacattg acgacttcgc tagaagtgc 30

<210> 153  
<211> 10  
<212> PRT  
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<220>  
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<400> 153  
Ala Asp Ile Asp Asp Phe Ala Arg Ser Ala  
1 5 10

<210> 154  
<211> 30  
<212> DNA  
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<220>  
<223> M13 coat protein VIII fragment oligonucleotide library

<220>  
<221> unsure  
<222> 1, 4, 8, 10, 13, 17, 20, 23, 26, 28  
<223> unknown base

<400> 154  
nwtasrntn ytnasrntn trntntnas 30

<210> 155  
<211> 30  
<212> DNA  
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<220>  
<223> M13 wt coat protein VIII fragment oligonucleotide

<400> 155  
tttaactccc tgcaagcctc agcgaccgaa 30

<210> 156  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> M13 wt coat protein VIII fragment

<400> 156  
Phe Asn Ser Leu Gln Ala Ser Ala Thr Glu  
1 5 10

<210> 157  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 157  
tatgaggctc ttgaggatat tgctactaac 30

<210> 158  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment

<400> 158  
Tyr Glu Ala Leu Glu Asp Ile Ala Thr Asn  
1 5 10

<210> 159  
<211> 30  
<212> DNA  
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<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 159  
tatgaggctc ttgaggatat tgctactaac 30

<210> 160  
<211> 10  
<212> PRT  
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<220>  
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<400> 160  
Tyr Glu Ala Leu Glu Asp Ile Ala Thr Asn  
1 5 10

<210> 161  
<211> 30  
<212> DNA  
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<220>  
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<400> 161  
tatgaggctc ttgaggatat tgctactaac 30

<210> 162  
<211> 10



<212> PRT  
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 <400> 162  
 Tyr Glu Ala Leu Glu Asp Ile Ala Thr Asn  
 1 5 10  
  
 <210> 163  
 <211> 30  
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 <213> Artificial sequence  
  
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 <223> M13 variant coat protein VIII fragment oligonucleotide  
  
 <400> 163  
 tatgacgttc ttcagattgc tgctattaac 30  
  
 <210> 164  
 <211> 10  
 <212> PRT  
 <213> Artificial sequence  
  
 <220>  
 <223> M13 variant coat protein VIII fragment  
  
 <400> 164  
 Tyr Asp Val Leu Gln Ile Ala Ala Ile Asn  
 1 5 10  
  
 <210> 165  
 <211> 30  
 <212> DNA  
 <213> Artificial sequence  
  
 <220>  
 <223> M13 variant coat protein VIII fragment oligonucleotide  
  
 <400> 165  
 cttaaggatc ttaaggctac tggtattcag 30  
  
 <210> 166  
 <211> 10  
 <212> PRT  
 <213> Artificial sequence  
  
 <220>  
 <223> M13 variant coat protein VIII fragment  
  
 <400> 166  
 Leu Lys Asp Leu Lys Ala Thr Val Ile Gln  
 1 5 10

<210> 167  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
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<400> 167  
tatgagacta ttaaggatga tattgttaag 30

<210> 168  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment

<400> 168  
Tyr Glu Thr Ile Lys Asp Asp Ile Val Lys  
1 5 10

<210> 169  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 169  
cttcagaata ttcacagtag tattagtaag 30

<210> 170  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment

<400> 170  
Leu Gln Asn Ile His Ser Ser Ile Ser Lys  
1 5 10

<210> 171  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 171  
tataagactg ttcaggggtgc tattgctaag 30

<210> 172  
<211> 10  
<212> PRT  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment

<400> 172  
Tyr Lys Thr Val Gln Gly Ala Ile Ala Lys  
1 5 10

<210> 173  
<211> 30  
<212> DNA  
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<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 173  
tataagacta ttaagagtat tgctaataag 30

<210> 174  
<211> 10  
<212> PRT  
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<220>  
<223> M13 variant coat protein VIII fragment

<400> 174  
Tyr Lys Thr Ile Lys Ser Ile Ala Asn Lys  
1 5 10

<210> 175  
<211> 30  
<212> DNA  
<213> Artificial sequence

<220>  
<223> M13 variant coat protein VIII fragment oligonucleotide

<400> 175  
tattagagtc ttcagattat tgctgctcag 30

<210> 176  
<211> 10  
<212> PRT  
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<220>

<223> M13 variant coat protein VIII fragment

<400> 176

Tyr Gln Ser Leu Gln Ile Ile Ala Ala Gln  
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<210> 184

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Leu Phe Phe Leu Leu Gly Thr Val His Leu  
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Tyr Tyr Leu Asn Ile Leu Ala Val Tyr Val  
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Thr Ala Arg His Ala Asn Asp Asn Asp Gly Ala His Arg Pro  
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Thr Ala Pro Asp Arg Ser Ser Asn Asp Ala His Ala Pro Thr  
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Gly Ser Pro Ser Asn Pro Gly Ala Arg Thr Arg Ala Gly Thr  
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Gly His Ala Gly His Pro His Arg Pro Arg His Pro Ala Arg  
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<400> 210

gcccgcgccca accgc 15

<210> 211

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Ala Arg Ala Asn Arg  
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<400> 212

cgccacaacc gccgc 15

<210> 213

<211> 5

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Arg His Asn Arg Arg  
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<400> 233

Ala Gly Arg Gly Thr Ser Ser Thr Arg Gly  
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<400> 234

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Pro Arg His Asp His His Pro Ala His Asp  
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gaccgcggcc gcaccaaccg caccgacacc 30

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Asp Arg Gly Arg Thr Asn Arg Thr Asp Thr  
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<400> 238

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<210> 239

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Arg Ala Asp His Gly Ser Arg Ala Ser His Asp Ala Ser Arg Arg  
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1 5 10 15

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<400> 253  
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1 5 10 15  
Ala Arg Gly Thr Gly  
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<210> 254  
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ccacgcccc 60

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Arg Gly His Ala Pro  
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<210> 256

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52, 55  
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Val Gly Ile Val

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<400> 270

His Ser Leu Ala Val Ile Asp Asp Asn Phe Tyr Trp Val Gly Phe  
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Tyr Gly Tyr Val

<210> 271

<211> 57

<212> DNA

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<220>  
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<210> 272  
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Leu Phe Leu Val

<210> 273  
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tgttaat 57

<210> 274  
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<400> 274  
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1 5 10 15  
  
His Val Val Asn

<210> 275  
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ttttgat 57

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Asn Ser Phe Asp

<210> 277

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tgtaaat 57

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<210> 280

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Ala Ala His His His His His His Ala

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Lys Ser Thr Phe Lys Lys Phe Leu Lys

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Asp Asp Gly Glu Ala  
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His His His His His His  
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